REMARKS/ARGUMENTS

Reconsideration of the present application, as amended, is respectfully requested.

The October 27, 2003 Office Action and the Examiner's comments have been carefully considered. In response, the claims are amended and remarks are set forth below in a sincere effort to place the present application in form for allowance. The amendments are supported by the application as originally filed. Therefore, no new matter is added.

No new issues are raised by the changes to the claims since claim 1 is amended to include the subject matter of a dependent claim, i.e., claim 18, and claims 3 and 19-23 are amended to be consistent with the change to claim 1.

Formal Matters

In the Office Action, claim 18 is objected to because of an informality. In response, claim 18 is canceled and subject matter from claim 18 is incorporated into claim 1, with the word "shaft" being changed to "shift".

In the Office Action, claim 19 is rejected under the second paragraph of 35 USC 112 as not providing proper antecedent basis

for the limitation "an indication of the position of the measuring site is reproduced." In response, claim 19 is amended to change the term "measuring site" to "microcoil" to overcome the rejection to the claim under 35 U.S.C. §112, second paragraph.

In view of the amendments to claims 18 and 19, reconsideration and withdrawal of the objection to claim 18 and the rejection of claim 19 are respectfully requested.

Prior Art Rejections

In the Office Action claims 1, 9, 12 and 24-26 are rejected under 35 USC 102(e) as being anticipated by USP 6,061,587 (Kucharczyk et al. '587). Claims 3-5 and 18-23 are rejected under 35 USC 103(a) as being unpatentable over Kucharczyk et al. '587. Claims 10, 11, 27 and 28 are rejected over 35 USC 103(a) as being unpatentable over Kucharczyk et al. '587 in view of USP 6,298,259 (Kucharczyk et al. '259).

The Examiner's rejections of claims 1, 3-5, 9 and 18-26 are respectfully traversed in view of the amendments to independent claim 1 and the remarks set forth below. The Examiner's rejection

of claims 10-12, 27 and 28 are rendered moot by the cancellation of these claims.

Claim 1 is amended to include subject matter from claim 18. Thus, claim 1 is now directed to a method for forming a magnetic resonance image in which several objectives are achieved, most importantly, motion of an object being examined is compensated for over time and a temperature variation is obtained. To this end, in the method, a microcoil is inserted into the object being examined and reference magnetic resonance signals are acquired at a reference temperature. Subsequently, the temperature in an area proximate the microcoil is increased and measuring magnetic resonance signals are acquired. The position of the microcoil is determined and a geometrical relationship is determined between the position of the microcoil and the object being examined.

The magnetic resonance image is derived or reconstructed from the acquired magnetic resonance signals and on the basis of the determined position of the microcoil. Thus, a reference magnetic resonance image is reconstructed from the reference magnetic resonance signals and a measuring magnetic resonance image is reconstructed from the measuring magnetic resonance signals, both on the basis of the determined position of the

microcoil.

A detail of the object being examined and an indication of the position of the microcoil are reproduced together in the magnetic resonance image. As such, a correct position of the detail of the object being examined in the magnetic resonance image is derived relative to the indication of the position of the microcoil on the basis of the position of the indication of the position of the microcoil and the determined geometrical relationship between the position of the microcoil and the object being examined. Thus, any movement of the detail of the object being examined is compensated for since motion of the object being examined is reflected in motion of the microcoil which is readily ascertainable from the magnetic resonance images.

Additional objectives of the method are then achieved by determining a temperature dependent chemical shift upon comparison of the measuring magnetic resonance signals (acquired after the temperature change) to the reference magnetic resonance signals (acquired before the temperature change), and also determining a local variation in temperature on the basis of the temperature dependent chemical shift. The temperature variation may be reconstructed by the reconstruction unit in the form of

thermal images. This is described in the specification at page 3, lines 26-34 and page 9, lines 26-30, *inter alia*.

Kucharczyk et al. '587 and Kucharczyk et al. '259 do not disclose, teach or suggest the features now set forth in claim 1.

With respect to Kucharczyk et al. '587, thermal elements 30 and thermal detectors 32 may be included within a catheter 4 inserted into an object being examined along with one or more microcoils 9, 9a, 10, 10a (col. 19, lines 3-17). Mention is also made of a change in MR signals being caused by a change in the temperature of tissue being examined (col. 11, lines 41-54).

Although Kucharczyk et al. '587 arguably shows enabling the temperature of the tissue being examined to be changed and monitored by means of thermal elements 30 and thermal detectors 32, the reference does not disclose, teach or suggest determining a temperature dependent chemical shift which is a positively recited method step in amended claim 1. The determination of such a temperature dependent chemical shift enables thermal images of the object being examined to be reconstructed.

Mere mention of the effect of temperature on magnetic resonance signals (col. 11, lines 41-54) cannot be considered to

teach or suggest a determination of a temperature dependent chemical shift.

Moreover, the ability to raise the temperature of the tissue being examined and monitor it (via thermal elements 30 and thermal detectors 32) also cannot be considered to teach or suggest a determination of a temperature dependent chemical shift. Rather, since Kucharczyk et al. '587 relates to monitoring the delivery of a drug using magnetic resonance imaging, it is highly likely that temperature control is needed to create optimum temperature conditions in the tissue for improving the efficacy and/or delivery of the drug. Indeed, Fig. 7 mentions that the spatial distribution of the drug delivery is monitored based on chosen tissue contrast parameters which include temperature, i.e., one temperature might be better suited for drug delivery than another.

Monitoring of the temperature as in Kucharczyk et al. '587 does not equate to determining a temperature dependent chemical shift from a comparison of two sets of magnetic resonance signals obtained before and after a temperature change is effected in the object being examined (as set forth in claim 1).

In view of the foregoing, Kucharczyk et al. '587 does not disclose, teach or suggest determining a temperature dependent chemical shift upon comparison of the measuring magnetic resonance signals (acquired after a temperature change) to the reference magnetic resonance signals (acquired before a temperature change), and subsequently determining a local variation in temperature on the basis of the temperature dependent chemical shift as now set forth in amended claim 1.

Kucharczyk et al. '289 does not disclose, teach or suggest determining a temperature dependent chemical shift or a local variation in temperature based thereon and therefore does not close the gap between the present claimed invention as defined by amended claim 1 and Kucharczyk et al. '587.

In view of the foregoing claim 1 is patentable over Kucharczyk et al. '587 under 35 USC 102 as well as 35 USC 103, either alone or in combination with Kucharczyk et al. '289.

Dependent claims 3-5, 9 and 19-26 are either directly or indirectly dependent on claim 1. These claims are separately patentable over the cited references and are patentable in view of their dependence on claim 1.

In particular, with respect to claims 22 and 23, these claims specify that additional microcoils are inserted into the object being examined and the position and orientation of a line or plane through the microcoils is measured. This is used to measure deformations in the anatomy of a patient (see the specification at page 7, lines 1-8). Kucharczyk et al. '587 and Kucharczyk et al. '289 mention using multiple coils for improving the visibility of the viewable signal by the MRI system (col. 17, line 16 to col. 18, line 14) but does not disclose, teach or suggest actually measuring a line or plane between multiple microcoils, i.e., to enable deformations in the anatomy of a patient to be measured.

In view of the foregoing, claims 1, 3-5, 9 and 19-26 are patentable over the cited references under 35 USC 102 as well as 35 USC 103.

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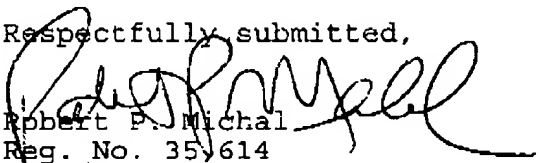
If the Examiner disagrees with any of the foregoing, the Examiner is respectfully requested to point out where there is support for a contrary view.

Entry of the amendment, allowance of the claims, and the passing of the application to issue are respectfully solicited.

If the Examiner has any comments, questions, objections or recommendations, the Examiner is invited to telephone the undersigned at the telephone number given below for prompt action.

Respectfully submitted,



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